HHS Public Access

Author manuscript

AIDS Care. Author manuscript; available in PMC 2015 November 01.

Published in final edited form as:

AIDS Care. 2014 ; 26(11): 1336–1345. doi:10.1080/09540121.2014.921277.

Orphan/vulnerable child caregiving moderates the association between women's autonomy and their BMI in three African countries

Mariano Kanamori,

Center for Research on U.S. Latino HIV/AIDS and Drug Abuse, Florida International University, 11200 SW 8th Street. PCA 353A, Miami, FL 33199, Phone: +1.571.241.6395, Fax: +1. 305.348.7405, mkanamor@fiu.edu

Olivia Carter-Pokras,

Department of Epidemiology and Biostatistics, University of Maryland College Park School of Public Health, 2234G SPH Bldg., College Park, MD 20742, Phone: +1-301-405-8037 (office), +1-301-257-6106 (cell), Fax: 301-314-9366, opokras@umd.edu

Sangeetha Madhavan,

Associate Professor of Demography and Sociology, Department of African-American Studies, Associate Director, Maryland Population Research Center, University of Maryland, 1119 Taliaferro Hall, College Park, MD 20742, Phone: +1-301-405-1166, smadhava@umd.edu

Robert Feldman,

Professor of Health Behavior, Department of Behavioral and Community Health, Affiliate Professor of Environmental Health, School of Public Health, University of Maryland, College Park, MD 20742, Phone: +1-301.405.2519, FAX: +1-301.314.9167, rfeldman@umd.edu

Xin He, and

Department of Epidemiology and Biostatistics, University of Maryland College Park School of Public Health, 2234 SPH Bldg., College Park, MD 20742, Phone: +1-301-405-2551, Fax: +1-301-314-9366, xinhe@umd.edu

Sunmin Lee

Department of Epidemiology and Biostatistics, University of Maryland College Park School of Public Health, 2234 SPH Bldg., College Park, MD 20742, Phone: +1-301-405-7251, Fax: +1-301-314-9366, sunmin@umd.edu

Abstract

Enhancement of women's autonomy is a key factor for improving women's health and nutrition. With nearly 12 million orphan and vulnerable children (OVC) in Africa due to HIV/AIDS, the study of OVC primary caregivers' nutrition is fundamental. We investigated the association between married women's autonomy and their nutritional status; explored whether this relationship was modified by OVC primary caregiving; and, analyzed whether decision-making autonomy mediated the association between household wealth and body mass index (BMI). This

Correspondence to: Mariano Kanamori.

cross-sectional study used data from Demographic Health Surveys collected during 2006–2007 from 20–49 year old women in Namibia (n=2,633), Swaziland (n=1,395), and Zambia (n=2,920). Analyses included logistic regression, Sobel and Goodman tests. Our results indicated that women's educational attainment increased the odds for being overweight (Swaziland and Zambia) and decreased the odds for being underweight (Namibia). In Zambia, *having at least primary education* increased the odds for being overweight only among child primary caregivers regardless of the OVC status of the child, and *having autonomy for buying everyday household items* increased the odds for being overweight only among OVC primary caregivers. *Decision-making autonomy* mediated the association between *household wealth* and OVC primary caregivers' *BMI* in Zambia (Z=2.13, p-value0.03). We concluded that depending on each country's contextual characteristics, having education can decrease the odds for being an underweight woman or increase the odds for being an overweight woman. Further studies should explore why in Namibia, education has an effect on women's overweight status only among women who are caring for a child.

Keywords

Caregivers; Personal autonomy; Child, orphaned; Africa south of the Sahara; Body Mass Index; Women; Thinness; Overweight

Introduction

The growing number of orphan and vulnerable children (OVC) in Africa—approaching 12 million children—has been described as the most tragic and long-term legacy of the HIV/AIDS pandemic in Africa (UNAIDS, UNICEF, & WHO, 2008). The primary caregivers of OVC face the dilemma of maintaining their own health while addressing the physical and emotional needs of additional family members (Muliira, 2011). These women are experiencing more severe economic and social problems (e.g., discrimination, stigma due to HIV/AIDS, and lower income) than other women from their own towns (Tarimo et al., 2009; Singh et al., 2011). Taking responsibility for the care and protection of orphans has negative implications for caregiver health over time and OVC caregivers experience higher levels of distress and chronic illness and less support from other adults compared to women who are not OVC caregivers (Littrell et al., 2009; Govender et al., 2012). Regardless of the large number of women who are primary caregivers of OVC, current studies involving OVC have focused on children's needs and overlooked challenges faced by their primary caregivers including nutritional effects of orphan care. Studying OVC primary caregivers' nutritional status is important because child caregiving could impact children, families, and the health of these caregivers.

The ongoing African nutritional transition is characterized by a shift toward a more energy dense diet, with increased fat, sugar, processed foods, and reduced physical activity (FAO, 2006). The BMI of 15–49 year old women is much higher in southern Africa than in other African regions (Garenne, 2011). According to 2006–2007 Demographic Health Surveys (DHS) country reports, the overweight prevalence among 15–49 year old women is greater in Namibia and Swaziland (28.0%) than in Zambia (19.2%), (Kanamori et al., 2013).

Among OVC primary caregivers, overweight prevalence (Namibia: 33.2%, Swaziland: 61.3%, Zambia: 26.9%) is higher than underweight prevalence (Namibia: 13.1%, Swaziland: 1.7%, Zambia: 7.2%), (Kanamori, 2013).

Previous studies in Africa have shown that women with lower levels of education and/or household decision-making autonomy are more likely to be underweight (Woldemicael, 2007; Elfhag & Rossner, 2005). Therefore, promoting women's autonomy has been identified as a critical and cost-effective nutritional intervention for helping households break the cycle of intergenerational deprivation (United Nations, 2012).

This study's objective was to investigate the association between married women's autonomy and their nutritional status and to explore whether this relationship was modified by OVC primary caregiving. Our study focused on two dimensions of women's autonomy: decision-making about a variety of household issues and knowledge autonomy measured by educational attainment (Woldemicael, 2007). Three OVC primary caregiving categories were included: a) OVC primary caregivers, b) non-OVC primary caregivers, and c) non-primary caregivers. Research questions were: 1) What is the association between married women's autonomy and their underweight/overweight status? 2) Does OVC primary caregiving status modify the effect of the association between married women's autonomy and their underweight/overweight status? and, 3) Does OVC primary caregivers' decision-making autonomy mediate the association between AWI and their BMI?

Methods

A cross-sectional study was conducted using secondary analyses of DHS data from Namibia (2006–2007), Swaziland (2006–2007), and Zambia (2007). This study included 20–49 year old married women who gave oral consent for participation and reported de jure household residency. Pregnant and three months or less postpartum women were excluded to avoid the impact of the fetus and lactation on BMI (Bitew, 2010). Women with BMI less than 12.0 or greater than 60.0 were also excluded as these might be cases of extreme anthropometric measures or resulting from data errors (Garenne, 2011). The Opinion Research Corporation Company Macro Institutional Review Board approved every DHS surveys (ICF, 2012).

The dependent variable, BMI (kg/m^2) was categorized in three groups: underweight (BMI < 18.5), normal weight (18.5 ≥ BMI < 25.0), and overweight (BMI ≥ 25.0).

The independent variable, household decision-making autonomy included five situations to determine whether a woman had the final say on: (1) her own health care, (2) large household purchases, (3) purchases of everyday household items, (4) visits to family or relatives, and (5) what to do with the money the husband earns. The response options were: (a) respondent alone, (b) respondent and husband/partner, (c) respondent and other person, (d) husband/partner alone, (e) someone else, f) other. For each question, a value of 1 was assigned if the response was (a), (b), or (c), and 0 for (d), (e), or (f). Decision-making autonomy was included as a dichotomous variable for each of the five situations as well as a continuous measurement (the values were added resulting in a score from 0 to 5), (Rahman,

2012). Educational attainment included: no education, primary, secondary and higher education.

The potential effect modifier, OVC primary caregiving status, included three categories. Primary caregivers were women who lived with a biological child under the age of 18 and/or who were primary caregivers of a non-biological child under the age of 18. This study uses DHS's definition for OVC: children with one or both parents deceased (orphans); and vulnerable children who a) have a chronically ill parent (sick for more than 3 consecutive months during the past 12 months) or b) live with an adult who was chronically ill or died during the past 12 months. The OVC status of the primary caregiving was based on the question: "How many orphans and vulnerable children live in your household?" OVC primary caregivers were primary caregivers who mentioned that one or more children living in their house. Non-OVC primary caregivers were primary caregivers who mentioned that no OVC lives in their house. Non-primary caregivers were women who did not live with a biological child under the age of 18 and/or who were primary caregivers of a non-biological child under the age of 18.

The Absolute Wealth Index (AWI) developed by Hohmann and Garenne (2011) and adapted from the Filmer and Pritchett's approach captures a wide range of household wealth distribution (Filmer & Pritchett, 1999; Garenne, 2011; Hohmann & Garenne, 2011).

Potential confounders included: women's age, education, work status, region of residence, parity and relationship with the household head; presence of a child 5 years old or younger living in the house; sex of the household head; and, number of household members, 18–49 year old women and men in the household.

Statistical analyses included data screening to check for outliers and errors, as well as descriptive statistics for continuous and discrete variables. Estimation of marginal means used analytic weights to correct for over-sampling and variations in survey response rates by region. Logistic regression analyses controlled for potential confounders and interactions. Additional simple and adjusted logistic regression models were used for selecting confounders. A variable was included as a confounder if the adjusted odds ratio was 10% different than the unadjusted odd ratio.

Collinearity between and within independent variables and potential confounders was tested by using Phi analyses when both variables were dichotomous, and Cramer's V for variables with three or more levels. A pair of independent variables with a Phi or and Cramer's V value of at least .70 was considered to have substantial collinearity and one variable was removed from the analysis. Multicollinearity among the independent variable and potential confounders was tested using two statistics: the tolerance value and the variance inflation factor (VIF). Multicollinearity was also considered to exist if a tolerance value less than 0.1 or a VIF greater than 10 were found (Menard et al., 2006; Myers et al., 2006). Mediation analyses were performed using Baron & Kenny's approach (1986). Significant associations were determined using 95% confidence intervals and p-values (α <0.05) using SPSS® 19.

Results

Sample characteristics

This study included 20 to 49 year old married women from Namibia (n=2,633), Swaziland (n=1,395), and Zambia (n=2,920), (Table 1). The prevalence of OVC caregiving among married women ranged from 27.7% in Namibia and Swaziland to 30.4% in Zambia. Higher proportions of women were overweight, had secondary education, and/or worked in agriculture in Namibia and Swaziland than in Zambia. More women in Swaziland and Zambia lived in rural than in urban areas.

OVC primary caregivers from Zambia had higher mean household decision-making autonomy scores than women from the other two caregiving groups (Figure 1). Swazi OVC primary caregivers had a lower mean household decision-making autonomy score than their counterparts from Namibia and Zambia.

Mean household decision-making autonomy differences by country within OVC primary caregivers

Swazi OVC primary caregivers had a lower mean household decision-making autonomy score than their counterparts from Namibia and Zambia. A higher proportion of OVC primary caregivers from Namibia had autonomy to make decisions regarding their own health (Namibia: 84.2%, Swaziland: 65.8% and Zambia: 70.9%) and to buy large household purchases (Namibia: 73.1%, Swaziland: 59.0% and Zambia: 63.4%) when compared to their counterparts from Swaziland and Zambia (Figure 2). A higher proportion of OVC primary caregivers from Zambia had autonomy for making purchases for everyday household items than their counterparts from Namibia (85.5% vs. 80.3% respectively). Compared to OVC primary caregivers from Swaziland, a higher proportion of Namibian and Zambian OVC primary caregivers had autonomy for deciding when to visit family or relatives (Swaziland: 47.5%, Namibia: 75.5%, and Zambia: 74.1%) as well as autonomy for deciding what to do with the money their husband earns (Swaziland: 44.1%, Namibia: 59.8%, and Zambia: 64.0%).

Adjusted models including normal weight and underweight women showed that having at least secondary education decreased the odds for being underweight in Namibia as compared to not having any education (Table 2). In Zambia, women who could decide what to do with their husband’s salary were less likely to be underweight than women who could not make this decision.

Adjusted models including normal weight and overweight women demonstrated that in Namibia, women’s decision-making and educational attainment were not associated with being overweight. In Swaziland, having at least secondary education increased the odds for being overweight as compared to not having any education. In Zambia, having at least primary education, having the final say on making purchases of everyday household items, having the final say on large household purchases, or having the final say on what to do with their husband’s salary increased the odds for being overweight compared to women who lacked these autonomy indicators.

Test for interactions

In Zambia, OVC primary caregiving modified the effect of the associations between married women's educational attainment and overweight, and between having the final say on making purchases of everyday household items and overweight. Having at least primary education increased the odds for being overweight among child primary caregivers regardless of the OVC status of the child. Having the final say on making purchases of everyday household items increased the odds for being overweight only among OVC primary caregivers (Table 3).

Mediation tests

Among OVC primary caregivers, autonomy partially mediated the association between AWI and married women's BMI in Zambia (Z=2.13, p=0.03), (Figure 3).

Discussion

Our findings demonstrate the important role that educational attainment has in the nutritional status among African married women. Having education decreased the odds for being an underweight woman in Namibia, and increased the odds for being an overweight woman in Swaziland and Zambia. In Namibia, women who had at least a secondary education were less likely to be underweight as compared to women with no education. Education has been identified as crucial for poverty reduction; improvement in gender equality, health and nutrition; reductions in infant and child mortality; and a reduction in the prevalence of HIV/AIDS transmission in sub-Saharan Africa (Fotso et al., 2009). It has been suggested that education protects women's nutritional status because educated women are more likely to have better skills that could benefit their children and/or their own health and nutrition (e.g., use health care facilities; keeping their places clean; access to health and nutrition information; from knowledge gleaned from reading newspapers, listening to the radio and watching television; effective interaction with doctors and nurses; better compliance with treatment recommendations), (Joshi, 1994).

In developed countries, education has also been associated with eating more frequently out of the home and lower adherence to the WHO recommended daily intake of vegetables (Krige et al., 2012). Further work should explore whether the association between education and these health behaviors is a possible explanation why our study also found that being a woman with at least primary education (Zambia) or at least secondary education (Swaziland) increased the odds for being overweight. Future studies should also explore the reasons why education is not associated with overweight status among non-child caregivers in Zambia.

This study found that Namibian women who had the final say on what to do with their husband's salary were less likely to be underweight. This finding supports UNESCO guidelines for addressing undernutrition problems in Africa including the fight against traditional stereotypes in the minds of both men and women that are reinforcing gender inequality (United Nations, 2012). The acquisition of basic literacy and numeracy is essential to promote women's capacity for taking charge of the household income and

budgeting. Our analyses including OVC primary caregivers showed that decision-making autonomy mediated the association between AWI and women's BMI in Zambia. Previous studies did not find women's autonomy to mediate the association between socio-economic factors and pre-natal and child delivery care services (Woldemicael, 2007).

As documented in DHS's country reports (2006–2007), the reasons why we found significant interaction and mediation effects only in Zambia could be related to the comparatively lower prevalence of households in Zambia than in the other two countries that have a female headship, a higher percentage of men with two or more wives, and lower women's mean age (years) at first marriage in urban (Namibia: 29.1, Swaziland: 27.9, Zambia: 19.6) as well as rural areas (Namibia: 27.4, Swaziland: 22.8, Zambia: 17.8). These factors could reflect different reasons and motivations for getting married, their levels of decision-making autonomy and their likelihood of continuing with higher education. Another important rationale could be differences in women's status in society by country as measured by levels of tolerance for violence against women. DHS reports (2006–2007) show that a much higher percentage of women and men in Zambia than the other two countries consider that a husband is justified in hitting or beating his wife in several situations (e.g. his wife burns the food, argues with him, goes out without telling him, neglects the children or refuses sexual intercourse with him).

Strengths and Limitations

To our knowledge, this is the first study that examined the role of OVC primary caregiving as a potential effect modifier on the association between women's autonomy and their underweight and overweight status in communities located in Southern Africa as well as the mediating role of women's decision-making autonomy on the association between household absolute wealth and women's BMI. Study strengths include use of two different dimensions of women's autonomy. This study used diverse and representative data of reproductive age women in three southern African countries with different underweight and overweight prevalence. DHS surveys contain core questions that are identical across countries, and height and weight were measured rather than relying on self-reported information.

Because this was a cross-sectional study with no direct measures of HIV status, it was not possible to determine which occurred first: the OVC caregiving status of the woman or her underweight or overweight status. Thus, findings are susceptible to a range of biases as a result of endogeneity and selection. Although education and skills acquisition can protect a woman's nutritional status and that of her children, women who are well protected and nourished also have a better chance to get educated due to factors related to both health and education. This study did not assess whether children who moved to the caregivers' homes came from homes with lower or higher socio-economic status nor did it assess the length, intensity, and type of primary caregiving. Data related to women's health status, dietary food intake, and intensity of primary caregiving by the type or quantity of assistance provided were not available in the DHS dataset. Due to contextual differences of African countries, findings may not be generalized outside these countries and with non-married women. The variable "final say on what to do with the money the husband earns" in

Swaziland seems to not be missing at random (with more missing data in the cases of rural and non-educated women). Due to the relevance of the question, this variable was retained in the study. This study has addressed the potential role of several socio-demographic and family composition factors as confounders. Additional confounding factors with direct links to HIV status that load onto BMI have not been included in the study (e.g., family members' HIV status; maternal or paternal death; gender of the deceased and surviving parent). The OVC definition is very broad. This study has not been able to address different OVC sub-categories. Due to limited clarity and known differences in standardization of the OVC definition across countries, aid agencies, and manuscripts, our findings should be compared cautiously with other studies' results.

Because women's autonomy may have different meaning due to the variation in cultural contexts, further studies should explore the validity of using DHS measurements for autonomy in each African country (Upadhyay & Karasek, 2012). Additional work should examine other dimensions of women's autonomy including freedom of movement, differences in age and education between marital partners, and the process of spouse selection (Upadhyay & Karasek, 2012).

Further studies should investigate cultural factors that may influence the association of women's autonomy and their increased likelihood for being overweight. Cultural factors should be taken into account when designing and implementing overweight prevention and control programs promoting women's autonomy. It has been suggested that overweight African women are reluctant to lose weight because in their culture fatness is associated with women's autonomy and wealth (Venter et al., 2009). Finally, additional work should explore the association between women's autonomy and their nutritional status in different family structures (e.g., polygamous/monogamous unions and single/multiple generational households). DHS 2006–2007 reports have documented that the prevalence of married women in a polygamous union varied in these three countries (Namibia 6%, Swaziland 18%, Zambia 14%). Polygamy could influence household composition and women's autonomy.

ACKNOWLEDGEMENTS

We acknowledge Dr. Michel Garenne as he has always been willing to answer questions and share his previous work related to the Absolute Wealth Index and to Mr. Arnaldo Gonzales who provided comments to the writing style. We are grateful to Macro International Inc. for making available the DHS data for these analyses.

This work was supported in part by the Centers for Disease Control and Prevention, Prevention Research Centers Program under the Cooperative Agreement Number 1 U48 DP001929 and by a P20 Exploratory Center of Excellence grant (P20MD002288; Sub-Project ID: 6068), funded by the National Institute on Minority Health and Health Disparities (NIMHD) of the National Institutes of Health (NIH) and housed within the Center for Research on U.S. Latino HIV/AIDS and Drug Abuse (CRUSADA) at Florida International University.

References

Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. J Pers Soc Psychol. 1986; 51:1173–1182. [PubMed: 3806354]

Central Statistical Office [Swaziland], and Macro International Inc. Swaziland Demographic and Health Survey 2006-07. Mbabane, Swaziland: Central Statistical Office and Macro International Inc; 2008.

Zambia Demographic and Health Survey 2007. Calverton, Maryland, USA: CSO and Macro International Inc; 2009. Central Statistical Office, Ministry of Health (MOH), Tropical Diseases Research Centre (TDRC), University of Zambia, and Macro International Inc.

Elfhag K, Rossner S. Who succeeds in maintaining weight loss? A conceptual review of factors associated with weight loss maintenance and weight regain. Obes Rev. 2005; 6:67–85. [PubMed: 15655039]

Filmer D, Pritchett L. The Effect of Household Wealth on Educational Attainment: Evidence From 35 Countries. Population and Development Review. 1999; 25:1, 85–120.

Food and Agriculture Organization. The double burden of malnutrition: case studies from six developing countries. Bulletin FAO Food and Nutrition Paper. 2006; 84:334.

Fotso JC, Ezeh A, Madise N, Ziraba A, Ogollah R. What does access to maternal care mean among the urban poor? Factors associated with use of appropriate maternal health services in the slum settlements of Nairobi, Kenya. Matern Child Health J. 2009; 13:130–137. [PubMed: 18297380]

Garenne, M. DHS Comparative Reports No. 27. Calverton, Maryland, USA: ICF Macro; 2011. Trends in Nutritional Status of Adult Women in Sub-Saharan Africa.

Govender K, Penning S, George G, Quinlan T. Weighing up the burden of care on caregivers of orphan children: the Amajuba District Child Health and Wellbeing Project, South Africa. AIDS Care. 2012; 24:712–721. [PubMed: 22106942]

Hindin MJ. Women's Autonomy, Status, and Nutrition in Zimbabwe, Zambia, and Malawi. In A Focus on Gender: Collected Papers on Gender Using DHS Data. 2005:93–115. ORC Macro, Calverton, Maryland, USA.

ICF, I. Survey Organization Manual for Demographic and Health Surveys. DHS, M., editor. ICF International; Calverton. Maryland: 2012.

Joshi AR. Maternal schooling and child health: preliminary analysis of the intervening mechanisms in rural Nepal. Health Transit Rev. 1994; 4:1–28. [PubMed: 10147162]

Kanamori M. The association of orphan and vulnerable child primary caregiving, household wealth, and female autonomy on women's body mass index in Namibia, Swaziland and Zambia (Doctoral dissertation, University of Maryland College Park, U.S). 2013 Retrieved from http://lib.guides.umd.edu/MDdissertations.

Krige S, Mahommodally F, Subratty A, Anwar H, Ramasawmy D. Relationship between socio-demographic factors and eating practices in a multicultural society. Food and Nutrition Sciences. 2012; 3:3, 286–295.

Littrell M, Boris NW, Brown L, Hill M, Macintyre K. The influence of orphan care and other household shocks on health status over time: a longitudinal study of children's caregivers in rural Malawi. AIDS Care. 2011; 23:1551–1561. [PubMed: 21711171]

Menard, S. Sage university paper series on the quantitative applications in the social sciences. Thousand Oaks, CA: Sage; 1995. Applied logistic regression analysis; p. 7-106.

Ministry of Health and Social Services [Namibia] and ICF Macro. Windhoek, Namibia: Namibia Health Facility Census 2009; 2010.

Muliira RS, Muliira JK. Health-promoting practices and the factors associated with self-reported poor health in caregivers of children orphaned by AIDS in southwest Uganda. African Journal of AIDS. 2011; 10:4, 479–486.

Myers RH. Classical and Modern Regression with Applications. PWS-Kent Publishing Company. 1990

Rahman M. Women's autonomy and unintended pregnancy among currently pregnant women in Bangladesh. Matern Child Health J. 2012; 16:1206–1214. [PubMed: 21989677]

Singh D, Chaudoir SR, Escobar MC, Kalichman S. Stigma, burden, social support, and willingness to care among caregivers of PLWHA in home-based care in South Africa. AIDS Care. 2011; 23:839–845. [PubMed: 21400316]

Tarimo EA, Kohi TW, Outwater A, Blystad A. Gender roles and informal care for patients with AIDS: a qualitative study from an urban area in Tanzania. J Transcult Nurs. 2009; 20:61–68. [PubMed: 18852478]

UNAIDS, UNICEF, & WHO. Children and AIDS: Second stocktaking report. New York: United Nations Children's Fund; 2008.

United Nations Development Programme. Africa Human Development Report 2012. Towards a Food Secure Future. 2012

Upadhyay UD, Karasek D. Women's empowerment and ideal family size: an examination of DHS empowerment measures in Sub-Saharan Africa. Int Perspect Sex Reprod Health. 2012; 38:2, 78–89.

Venter FC, Walsh CM, Slabber M, Bester CJ. Body size perception of African women (25-44 years) in Mangaung. Journal of Family Ecology and Consumer Science. 2009; 37:12–23.

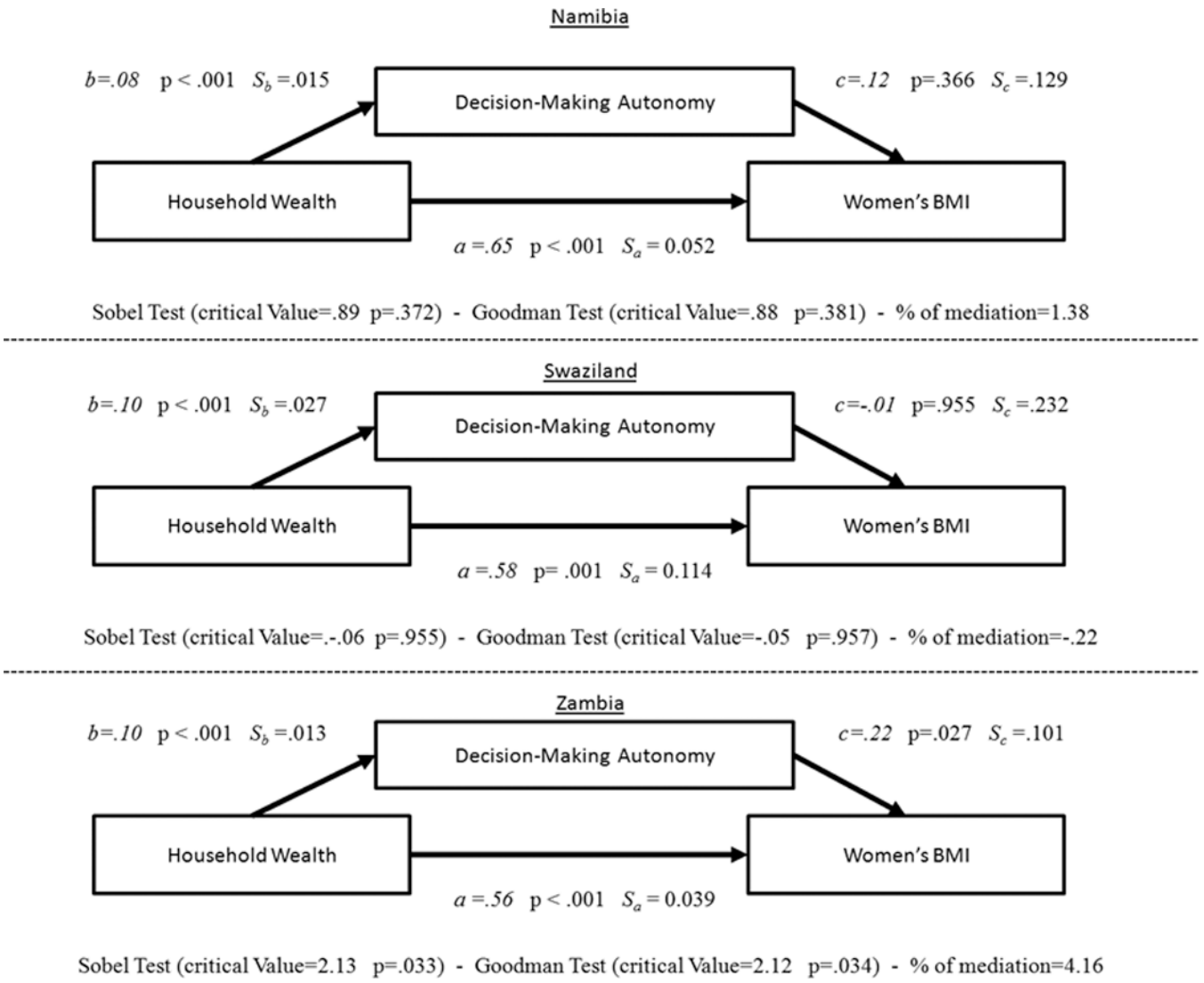

Figure 1.

Household decision-making autonomy by country and OVC primary caregiving status

a represents the unstandarized regression coefficient for the relationship between BMI and AWI. $\boldsymbol{S_a}$ represents the standard error of said regression coefficient. ***b*** represents the unstandarized regression coefficient for the relationship between OVC primary caregivers' decision-making autonomy and AWI. $\boldsymbol{S_b}$ represents the standard error of said regression coefficient. ***c*** represents the unstandarized regression coefficient for the relationship between BMI and OVC primary caregivers' decision-making autonomy controlling for AWI. $\boldsymbol{S_a}$ represents the standard error of said regression coefficient. Both the Sobel and the Goodman test yield critical z-scores as the test statistics.

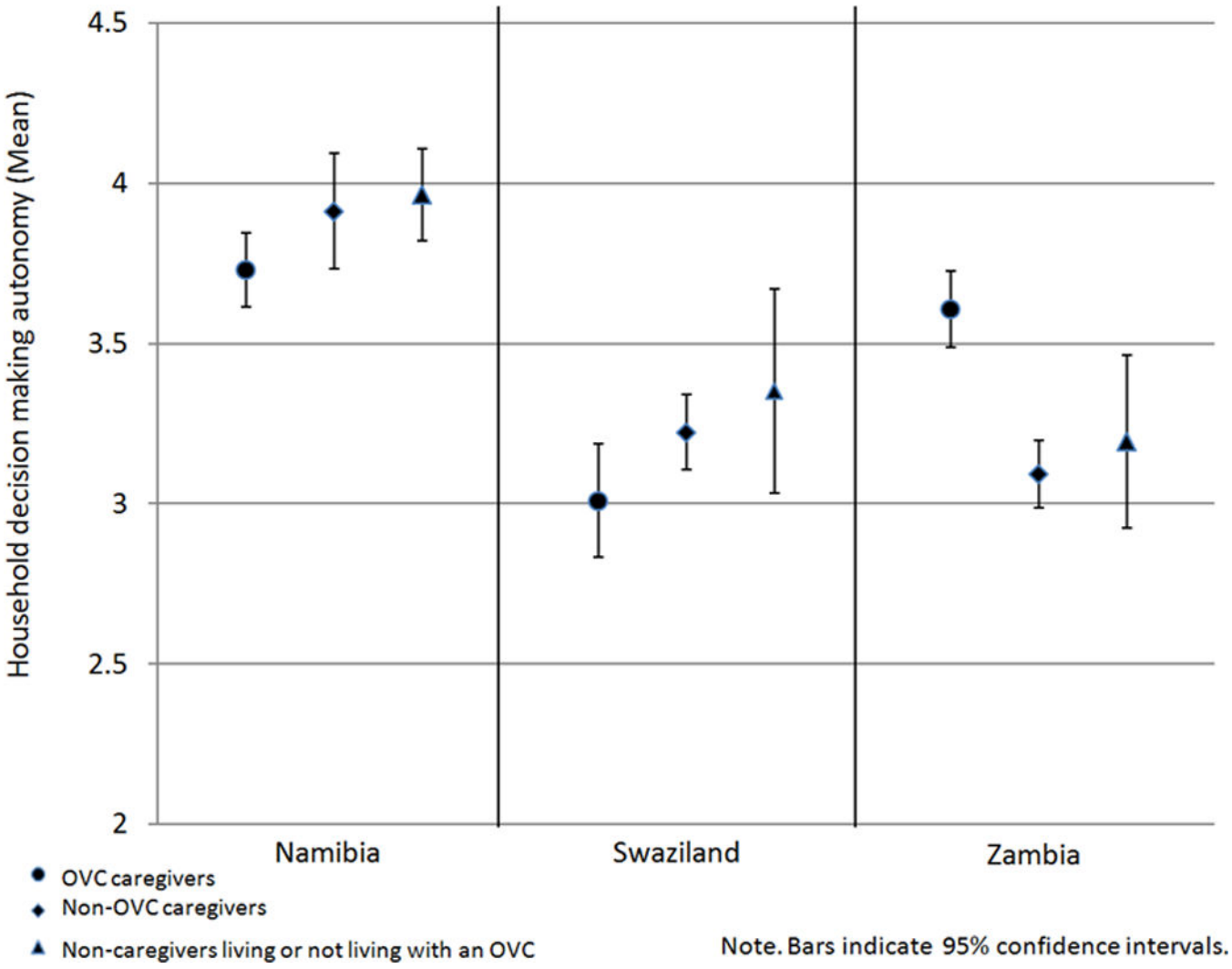

Figure 2.
Household decision-making autonomy factors for OVC primary caregivers by country

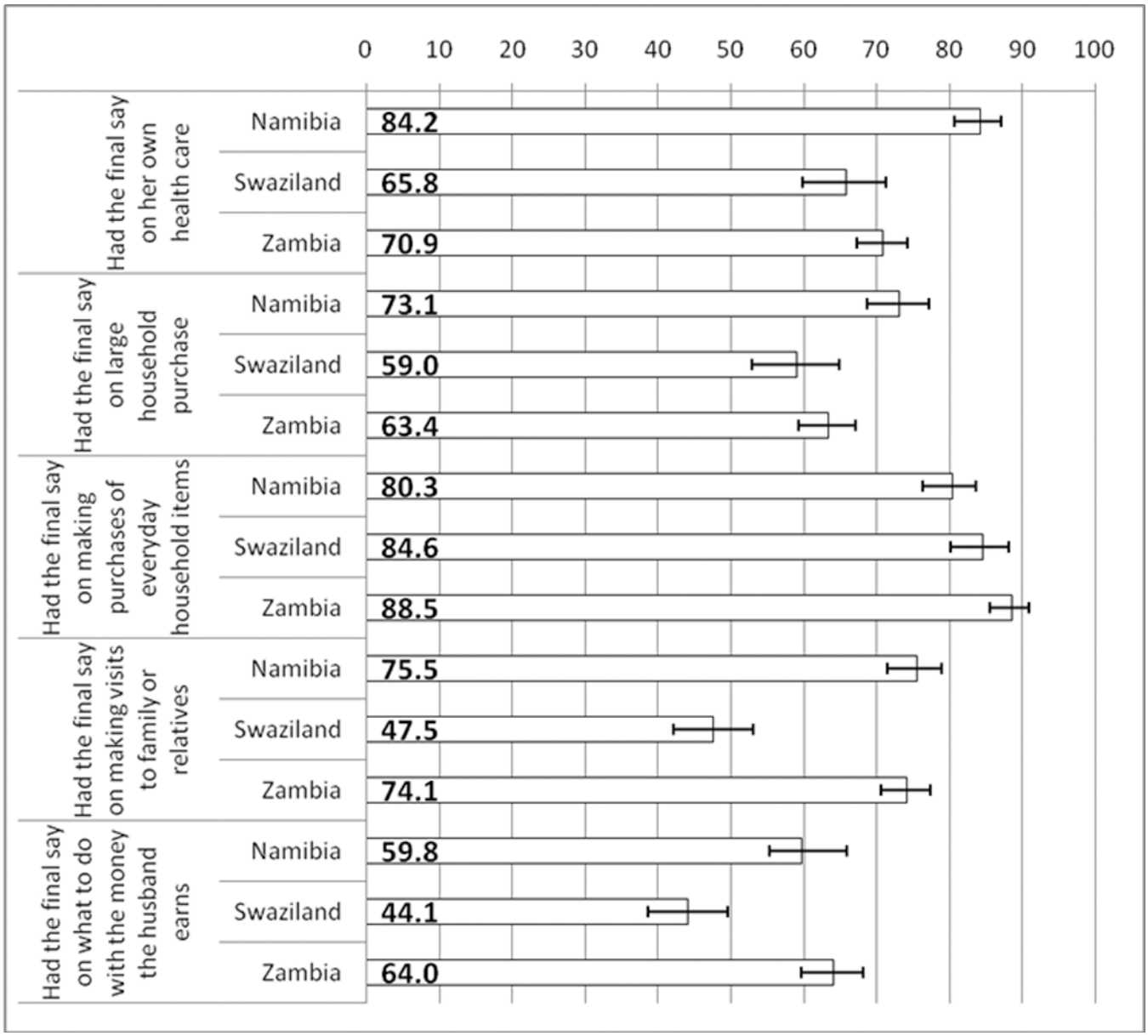

Figure 3.

Mediation analyses of OVC primary caregivers' decision-making autonomy on the association between their Absolute Wealth and their Body Mass Index.

Table 1

Socio-demographic characteristics by country

	Namibia (n=2,633) n (%)		Swaziland (n=1,395) n (%)		Zambia (n=2,920) n (%)	
Nutritional status[a]						
-Underweight	249	(9.5%)	12	(0.9%)	231	(7.9%)
-Normal Weight	1,221	(46.4%)	447	(32.0%)	2,040	(69.9%)
-Overweight	1,163	(44.2%)	936	(67.1%)	649	(22.2%)
OVC caregiving status						
-OVC caregiver	730	(27.7%)	340	(27.7%)	888	(30.4%)
-Non-OVC caregiver	1,446	(54.9%)	800	(65.3%)	1,844	(63.2%)
-Non-caregivers	457	(17.4%)	86	(7.0%)	188	(6.4%)
Women's Education						
-No Education	344	(13.1%)	155	(11.1%)	383	(13.1%)
-Primary Education	842	(32.0%)	451	(32.3%)	1,719	(58.9%)
-Secondary Education	1,216	(46.2%)	615	(44.1%)	682	(23.4%)
-Higher Education	231	(8.8%)	174	(12.5%)	136	(4.7%)
Women's Age						
Mean (standard deviation)	34.97	(7.85)	33.75	(7.83)	32.18	(8.04)
Women's work status[b]						
-Not working	1,009	(38.6%)	603	(43.3%)	1,089	(37.3%)
-Working in agriculture	285	(10.9%)	88	(6.3%)	925	(31.7%)
-Working other than agriculture	1,320	(50.5%)	702	(50.4%)	903	(31.0%)
Region of Residence						
-Urban	1,220	(46.3%)	434	(31.1%)	1,155	(39.6%)
-Rural	1,413	(53.7%)	961	(68.9%)	1,765	(60.4%)
Children ≤5 years old in Household						
-Yes	1,708	(64.9%)	930	(66.7%)	2,339	(80.1%)
Parity (number of children ever born)						
Mean (standard deviation)	3.38	(2.19)	3.68	(2.43)	4.33	(2.67)
Absolute Wealth Index						

	Namibia (n=2,633) n (%)		Swaziland (n=1,395) n (%)		Zambia (n=2,920) n (%)	
Mean (standard deviation)	6.44	(4.01)	6.60	(3.23)	4.11	(3.17)

[a] Underweight (BMI < 18.5), normal weight (18.5 ≥ BMI < 25.0), and overweight (BMI ≥ 25.0).

[b] Non-agricultural jobs include the following: professional, technical, management, clerical, sales, household and domestic services, skilled or unskilled manual jobs. Agricultural jobs include self-employed as well as employed people.

AIDS Care. Author manuscript; available in PMC 2015 November 01.

Table 2

Association between women's autonomy and women's underweight and overweight status.[≠]

	Namibia[¥]			Swaziland[▲]			Zambia[ψ]		
Underweight vs. Normal Weight									
Bivariate Models									
Household decision-making autonomy									
Have final say on own health care	0.88	(0.62, 1.25)					0.92	(0.69, 1.22)	
Have final say on making large household purchases	0.71	(0.53, 0.95)	*				0.99	(0.75. 1.30)	
Have final say on making household purchases for daily needs	0.68	(0.50, 0.93)	*				0.96	(0.68, 1.35)	
Have final say on visits to family or relatives	0.80	(0.59, 1.09)					1.09	(0.81, 1.46)	
Have final say on deciding what to do with money husband earns	0.89	(0.68, 1.18)					0.73	(0.56, 0.96)	*
Educational attainment									
-No education	1.00						1.00		
-Primary education	0.69	(0.49, 0.99)	*				0.92	(0.63, 1.33)	
-Secondary education	0.37	(0.25, 0.54)	***				0.62	(0.39, 0.99)	
-Higher education	0.07	(0.02, 0.30)	***				0.99	(0.42, 2.32)	
Adjusted Models									
Household decision-making autonomy									
Have final say on own health care	1.31	(0.84, 2.04)					0.97	(0.70, 1.33)	
Have final say on making large household purchases[Ƀ]									
Have final say on making household purchases for daily needs	0.77	(0.50,1.19)					1.03	(0.70, 1.52)	
Have final say on visits to family or relatives	1.09	(0.73,1.62)					1.20	(0.86,1.68)	
Have final say on deciding what to do with money husband earns	1.14	(0.82,1.58)					0.73	(0.54,0.97)	*
Educational attainment									
-No education	1.00						1.00		
-Primary education	0.79	(0.54,1.13)					0.94	(0.65,1.36)	
-Secondary education	0.52	(0.34,0.79)	**				0.66	(0.41,1.06)	
-Higher education	0.13	(0.03,0.57)	**				1.07	(0.45,2.55)	
Overweight vs. Normal Weight									
Bivariate Models									
Household decision-making autonomy									

	Namibia[¥]			Swaziland[▲]			Zambia[ψ]		
Have final say on own health care	1.36	(1.08, 1.70)	**	1.11	(0.87, 1.42)		1.29	(1.06, 1.56)	*
Have final say on making large household purchases	1.46	(1.20,1.77)	***	1.21	(0.96,1.53)		1.74	(1.44,2.09)	***
Have final say on making household purchases for daily needs	1.4	(1.20,1.84)	***	0.96	(0.71,1.30)		1.97	(1.51,2.59)	***
Have final say on visits to family or relatives	1.61	(1.32,1.97)	***	1.24	(0.99,1.56)		1.62	(1.32,1.98)	***
Have final say on deciding what to do with money husband earns	1.34	(1.13,1.59)	**	1.01	(0.81,1.27)		1.83	(1.51,2.21)	***
Educational attainment									
-No education	1.00			1.00			1.00		
-Primary education	1.31	(0.98,1.742)		1.12	(0.76,1.64)		2.25	(1.57,3.23)	***
-Secondary education	2.14	(1.63,2.81)	***	1.36	(0.94,1.98)		3.74	(2.56,5.46)	***
-Higher education	3.76	(2.60,5.44)	***	2.15	(1.32,3.49)	**	11.49	(7.05,18.72)	***
Adjusted Models									
Household decision-making autonomy									
Have final say on own health care	0.86	(0.64, 1.16)		1.01	(0.76,1.34)		0.85	(0.68,1.06)	
Have final say on making large household purchases[Ƀ]				1.02	(0.76,1.36)		1.27	(1.02,1.59)	*
Have final say on making household purchases for daily needs	1.05	(0.78,1.42)		0.76	(0.54,1.07)		1.32	(0.97,1.79)	
Have final say on visits to family or relatives	1.15	(0.87,1.51)		1.13	(0.87,1.47)		1.19	(0.94,1.51)	
Have final say on deciding what to do with money husband earns	1.03	(0.84,1.26)		1.12	(0.88,1.43)		1.34	(1.08,1.66)	**
Educational attainment									
-No education	1.00			1.00			1.00		
-Primary education	1.03	(0.76,1.39)		1.29	(0.86, 1.93)		2.11	(1.46,3.03)	***
-Secondary education	1.10	(0.80,1.50)		1.87	(1.25,2.78)	**	3.24	(2.20,4.76)	***
-Higher education	1.36	(0.90,2.01)		2.44	(1.46,4.08)	**	9.10	(5.54,14.96)	***

*p value <0.05,

**p value <0.01,

***p value < 0.001

[Ƀ]This variable was not included in the logistic regression model due to high collinearity with the variable "Have final say on making household purchases for daily needs."

[≠]BMI was defined as weight in kilograms divided by height squared in meters (kg/m^2). BMI was categorized in three groups: underweight (BMI < 18.5), normal weight (18.5 ≥ BMI < 25.0), and overweight (BMI ≥ 25.0).

¥Logistic regression model for underweight vs. normal weight is adjusted for work and AWI. Logistic regression model for overweight vs. normal weight is adjusted for parity, work, AWI and the interaction between OVC primary caregiving and educational attainment.

▲Logistic regression model for underweight vs. normal weight was not performed due to the small number of underweight cases (n=12, 0.9%). Logistic regression model for overweight vs. normal weight is adjusted for women's age.

ψLogistic regression model for underweight vs. normal weight is adjusted for region and women's age

AIDS Care. Author manuscript; available in PMC 2015 November 01.

Table 3

Association between women's autonomy and women's overweight status stratified by OVC caregiving status, Zambia.[≠]

	OVC caregivers			Non-OVC caregivers			Non-caregivers	
	OR	**95% CI**		**OR**	**95% CI**		**OR**	**95% CI**
	OVERWEIGHT VS. NORMAL WEIGHT							
Household decision-making autonomy								
Have final say on own health care	0.77	(0.52, 1.12)		0.91	(0.68, 1.22)		0.66	(0.25, 1.76)
Have final say on making large household purchases	1.45	(0.99, 2.13)		1.19	(0.89, 1.58)		1.07	(0.39, 2.97)
Have final say on making household purchases for daily needs	2.02	(1.03, 3.95)	*	1.28	(0.88, 1.85)		0.45	(0.14, 1.45)
Have final say on visits to family or relatives	1.41	(0.93, 2.14)		1.05	(0.78, 1.42)		2.37	(0.76, 7.44)
Have final say on deciding what to do with money husband earns	1.41	(0.96, 2.06)		1.26	(0.96, 1.66)		1.76	(0.64, 4.81)
Educational attainment								
-No education	1.00			1.00			1.00	
-Primary education	3.10	(1.37, 7.02)	**	1.88	(1.22, 2.89)	*	1.36	(0.35, 5.29)
-Secondary education	5.02	(2.17, 11.59)	***	2.82	(1.77, 4.50)	***	1.73	(0.41, 7.38)
-Higher education	10.48	(4.15, 26.47)	***	13.69	(6.61, 28.37)	***	1.44	(0.19, 10.76)

*p value <0.05,

**p value <0.01,

***p value < 0.001

[≠]BMI was defined as weight in kilograms divided by height squared in meters (kg/m^2). BMI was categorized in three groups: underweight (BMI < 18.5), normal weight (18.5 ≥ BMI < 25.0), and overweight (BMI ≥ 25.0). Logistic regression model adjusted for parity, work and AWI.